ITPENERGISED

Onshore Renewables & Storage Series

Hybrid Renewables Explainer

Thought Leadership

Introduction

This mini-series takes a closer look at hybrid renewables and how, among a number of solutions, it has the potential to support the Paris Agreement, the UN Sustainable Development Goals (SDGs), a growing world ambition to achieve net zero in our lifetime and to outperform current Environment and Social Governance (ESG) value propositions. This series is written for boards and investment committees of funds, utilities, developers, policy makers and network companies who would like to:

1. Increase returns in lower wind energy yield years;
2. Increase returns when project grid charges are anticipated to start rising;
3. Increase the number and variety of returns by maximising your grid connection as route to market;
4. Increase returns with more valuable flatter generation profiles to offtakers / internal retail position;
5. Reduce lifetime cost of energy at a system level, increase self-balancing and reduce costs of balancing;
6. Develop a platform capable of incubating innovation that cuts across silos from pilots to scale;
7. Diversify risk at the point of connection;
8. Defer investments in grid infrastructure;
9. Introduce option value into the portfolio, at least cost, even at the development stage; and
10. Outperform your current ESG proposition with higher renewable energy density for given land use.

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Definition

There is a trend to develop and implement wind-solar-storage-EV charging technologies in various combinations and permutations with the same grid connection and in the same physical location. ITPEnergised has been involved from the early feasibility stages of these schemes in the UK and overseas in both mainland and island contexts for communities, governments, utilities, developers and industry.

WindEurope defines a Hybrid Power Plant (HPP) as it "refers to a power-generating facility that converts primary energy into electrical energy and which consists of more than one power-generating modules connected to a network at one connection point." The definition is extensive and can be used to include various types of renewables as well as fossil fuels.

In the US each Independent System Operator (ISO) or Regional Transmission Organisation (RTO) develops unique approaches as to how co-located and hybrid resources can interconnect and participate in energy markets. The US Federal Energy Regulatory Commission (FERC), in its 23 July 2020 technical conference, stops short of any prescriptive policy changes but the treatment of these configurations can be two resources or one. It appears that two or more separate co-located resources is colocation, whilst one integrated hybrid resource is the hybrid renewable definition[1].

For the purpose of this paper, the definition of Hybrid Renewable Power Plant[2] (HRPP) or hybrid renewables are used, with or without storage, given that it is the more progressive of the definitions. There also remains the option to convert a colocation project to a hybrid scheme with an overall control layer, much in the same way as a microgrid operates, so HRPP is more descriptive of an achievable future state. For HRPPs with an overarching controller, this simplifies the grid compliance at the point of connection and operations and maintenance (O&M). In the future we may see the HRPP working as a platform with additional technologies being able to be "bolted on" as we electrify transport – EV charging - and electrify heat.

Market

The global market for HRPPs estimates ranges from 750 to 1,500MW[2] of wind and solar mainly in Australia, SE Asia, Europe, UK and the US. India, is particularly advanced from a policy perspective, with The Ministry of New and Renewable Energy's (MNRE) National Wind-Solar Hybrid Policy was introduced in 2018. This provides a framework for the promotion of large grid-connected wind-solar photovoltaics (PV) hybrid systems for efficient utilisation of transmission infrastructure and land. This policy has since been updated to include for storage. India, like Australia, has an especially high negative correlation between wind and solar leading to more project run hours throughout the year. HRPP development is also underway in Germany, Spain, Netherlands and the UK.

Utilities and developers are increasingly developing or retrofitting to HRPPs and some key themes[3] emerge:

- the desire to maximise the energy density of renewables within existing constraints to support achieving net zero;
- the desire to maximise the capacity factor of a project's most valuable asset – the grid connection; and
- the ability to produce a generation profile more resembling baseload, with an amelioration of balancing requirements, that can be more suitable for customers.

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On project sizing, the ratio of wind to solar varies widely depending on whether the site is weighted towards more solar rich resource than wind or vice versa. In the former case, there may be more solar capacity than wind capacity within the HRPP to optimise the economics. On a global energy resources map, if we overlay a heat map of solar energy density resources and wind energy resources we can see where these may converge into HRPP schemes that may have more full load hours. These would then have to be further assessed for proximity to demand centres, to get a more holistic picture.

Looking at the existing market substrate – the existing market which hybrids could be retrofitted to – shows strong potential. In the right economic and regulatory environment, the potential hybrid market in the UK could "bolt on" to some of the following existing market segments:

Segment	GW	Projects
Renewable/storage projects going through consenting	16.9	1,338
Operational onshore wind farms that could convert to HRPP	13.7	2,568
Operational solar PV farms that could add storage	8.5	1,320
Operational storage that could add some form of solar PV	0.99	88

Table 1—UK market substrate for deploying hybrid renewables[4]

Table 1 shows the upper limit to the existing market substrate for deploying hybrid renewables in the UK as not all sites will be suitable. WindEurope estimates 190GW of onshore wind capacity with SolarPower Europe estimating 137GW of solar capacity in Europe in 2020. Global onshore wind[5] is expected to amount to 654.4GW with global solar[6] at 742GW in 2020. Whilst each of the opportunities would need to be subject to local, economic and regulatory feasibility, the size of the global and regional market substrate that could support some form of hybrid renewables appears to be significant.

In the next part of this series, we will provide an overview of some of the enablers and barriers for hybrid renewables by asset life cycle.

[1] Pairing Battery Storage with Renewables: "Co-Location" or "Hybrid?," JDSupra, 7 August 2020, https://www.jdsupra.com/legalnews/pairing-battery-storage-with-renewables-74795/

[2] The Role of Hybrid Renewables in the Battle Against Intermittency, Solarplaza, 9 July 2020, https://www.solarplaza.com/channels/future-grid/12196/role-hybrid-renewables-battle-against-intermittency/

[3] Joined at the hip: A hybrid future for onshore renewables, Energy Storage News, 25 March 2020, https://www.energy-storage.news/blogs/joined-at-the-hip-a-hybrid-future-for-onshore-renewables

[4] Recent data taken from the RenewableUK database

[5] Statista and IEA

[6] PV magazine, June 2020, https://www.pv-magazine.com/2020/06/16/global-solar-capacity-may-reach-1448-gw-in-2024/